



Executive Summary



Charting Common Ground for Salmon and Buildings was prepared as part of a sustained effort by the City of Seattle to reconcile the needs of the natural environment with those of the region's human inhabitants, with a specific focus on the interplay between salmon and people. While there is compelling evidence that building related industries, the construction process, and the operation and dismantling of buildings affect the environment in general, what is not so clear is the extent to which these dynamics affect salmon. Paralleling efforts focused on Salmon Friendly Gardening practices, as developed by Seattle Public Utilities, and the Salmon-Safe™ Farm Management Certification Program, as originally developed by The Pacific Rivers Council, Inc. and now under the auspices of Salmon-Safe Inc., this report explores how buildings fit into the salmon decline puzzle, and establishes a framework to identify buildings' direct and indirect contributions to this decline. Additionally, guidelines are offered that identify specific strategies to lessen the building-related burdens imposed on salmon and their habitat.

The report notes a disturbing long term trend: the decline of wild salmon in the Pacific Northwest. Indeed, the numbers are staggering: according to the most recently published sustainability indicators report for the Seattle region, local wild salmon runs declined by 50% to 75% from the mid-1980's until the early 1990's at which time they stabilized at dangerously low levels. And, while significant study has assessed the relationships between *where* buildings are located and salmon habitat decline, much less study has focused on the aggregate toll that buildings through their life cycle have on salmon and the waters in which they live. While the boundaries for this study are broad, this inquiry is narrowed to a few key building-related spheres of influence that represent either a high mitigation potential or for which little primary research has been undertaken:

- generic *site* issues (independent of building location)
- *upstream* material environmental burdens – the BaselineGreen™ analysis
- building *use* phase impacts
- *downstream* material environmental burdens

Reflecting the uncertainty inherent in assigning precise cause and effect relationships, we introduce the precautionary principle as a basis to establish association between particular actions and outcomes connected to decline, summarized in the following statement:

“Where an activity raises threats of harm to the environment or human health, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically.”

The U.S. Green Building Council's LEED™ (Leadership in Energy and Environmental Design) green building rating system serves as the report's organizational framework, while the upstream environmental burden data associated with building materials is derived from BaselineGreen™ which identifies three impact categories (greenhouse gases, criteria air pollutants, and toxic releases) linked to the bill of materials for new single-



family residential, new office, and new retail construction in the tri-county region (Snohomish, King, and Pierce).

The principal conclusion of the BaselineGreen™ analysis is that the upstream impacts of building materials on salmon in the tri-county region, in *quantitative* terms, is relatively small, particularly when compared to impacts associated with other regional industries. Moreover, although the three BaselineGreen™ analyses indicated that, for average construction in the entire U.S., many building related materials and products are associated with upstream toxic releases, air pollution, and greenhouse gas emissions, *the data suggest that local and regional industries in Seattle and the State of Washington are “cleaner and greener” than the U.S. average.* State of Washington toxic release data from 1999 associated with building-related industries reveal relatively small documented toxic releases to water, no toxic releases to land, and toxic releases to air less than 5% of the statewide total. Therefore, specifying materials and products from local and/or regional manufacturers will not necessarily result in an increase in associated upstream environmental burdens at the local and regional scale, and may, in the case of Washington, *improve* the environmental performance as compared with national averages. With the exception of cement and fabricated steel products, the same can be said for Washington State’s upstream criteria air pollutant and greenhouse gas emissions.

For the five areas tracked by BaselineGreen™ — toxic releases to water, toxic releases to land, toxic releases to air, criteria air pollutants, greenhouse gas emissions – our findings are:

- **Toxic releases to water:**
Compared to other industries such as paper manufacturing, building related industrial toxic releases to water reported in 1999 were less than 1 percent. This is true for both the three county region and the rest of the State of Washington. These releases to water were made by three wood treatment facilities, one of which is located in the tri-county region.
- **Toxic releases to land:**
With the exception of waste disposal, building related industrial toxic releases to land reported in 1999 were zero. This is true for both the three county region and the rest of the State of Washington.
- **Toxic releases to air:**
Compared to other industries, building related industrial toxic releases to air in 1999 were relatively small. The percentage of statewide reported toxic releases to air that can be attributed to building related industries is less than 5% of the total.
- **Criteria air pollutants:**
With the exception of cement, building related industrial criteria air pollutant releases in 1999 were relatively small. The cement industry accounts for a significant share of all types of criteria air pollutant emissions in the three county region.
- **Greenhouse gas emissions:**
Emissions of CO₂ associated with the manufacture of cement and fabricated steel products account for a substantial portion of greenhouse gas emissions in the three county region and possibly a large portion of greenhouse gases in the rest of the State of Washington. Two cement plants and one lime facility in the tri-county region account for approximately 1.4 million tons of CO₂ emissions per year, while



the CO2 emissions total for the steel product manufacturer located in King County is about 250,000 tons per year.

However, the BaselineGreen™ findings may not tell the whole story due to possible weaknesses in the TRI data. These include the potential for industry misreporting of emissions, the provision for small quantity generators to avoid reporting requirements, and the potency associated with persistent bioaccumulative toxins (PBTs) as a class of chemicals, and other highly toxic chemicals, that may not be reflected in the way data are currently reported, nor account for the cumulative, long-term and synergistic effects of multiple chemical releases.

With the BaselineGreen™ analysis not revealing a substantial *direct* link to salmon decline, our study pursued five other possible building related activities as having a potentially greater impact on salmon habitats in the region:

- **Stormwater Runoff & Impervious Cover:**
The rule of thumb is that watershed health is threatened when impervious cover exceeds 10%. Since most of Seattle exceeds this level, we concur with Seattle's current aggressive stormwater management practices and strict contaminant control of runoff consistent with the State of Washington Department of Ecology's "Stormwater Management Manual for Western Washington".
- **Salmon-Friendly Hydro, Greenhouse Gas Emissions, & Ozone Depletion:**
The City of Seattle should be commended for its attention to the potential damaging affect of hydro facilities on salmon with the upgrading of its hydro facilities to ensure that there is no blockage of salmon passage, in addition to meeting the requirements of the Low Impact Hydropower Institute. While hydro does not contribute to greenhouse gas emissions, several building related industries in the tri-county region do, most notably the two cement kilns located on the Duwamish Waterway. Efforts to mitigate greenhouse gas emissions should be pursued, as should the substitution of alternative cements, such as fly ash, to reduce the net CO2 impact of concrete on salmon. The release of CFCs and HCFCs contributes to stratospheric ozone layer depletion, resulting in increased exposure to ultraviolet radiation, to which salmon have vulnerability. Our analysis found two manufacturers in the tri-county region using CFCs, despite their ban as of 1996. We recommend no allowance for continued use of CFCs, and an accelerated phase-out of all ozone depleting compounds as called for by the Montreal Protocol; at a minimum, compliance with the phase-out scheduled should be verified for all tri-county manufacturers.
- **Sand & Gravel Mining:**
Washington State is the nation's fifth largest source of aggregates; in the tri-county region alone, gravel mining operations cover over 9,000 acres. The extraction of sand and gravel disrupts habitat and contributes to erosion and sedimentation. We recommend specifying alternative aggregates for concrete mixes, and strict monitoring for all current sand and gravel operations. Policies for grandfathering of permitted facilities should be carefully reviewed to ensure that practices that could contribute to salmon decline are discontinued. Furthermore, with an estimated cost of \$50,000, we recommend the City of Seattle, in conjunction with other regional governments, consider pursuing the elements of a study proposed in the 1999 state legislative session (House Bill 1284) regarding sand, gravel, and rock



resource mining and its impact on salmon habitat and urban development, and identify environmentally sound sand, gravel and rock deposits. Current evaluations predict that existing mines will be unable to fulfill future demand for sand, gravel or rock.

- **Forest & Agrifiber Products:**

Forested lands produce both wood and salmon, with the extraction of wood and related forest practices contributing to loss of salmon habitat. Based on discussions with a certifier for the Forest Stewardship Council (FSC) regarding the accrued benefits associated with FSC certified products, the authors recommend specifying FSC-certified wood products and materials when they are cost-competitive and provide equal or superior performance than non-FSC certified wood products and materials. In addition to choosing products that ensure greater protection to salmon than non-FSC certified sources, this action will help to bolster market demand, and potentially catalyze an increase in FSC-certified forests, recognizing that less than 2% of Washington State's forested acreage is currently FSC certified. Furthermore, to reduce the burden on forests, the authors also recommend increased use of agrifiber products, such as wheat straw board, and support the establishment of wheat straw-based manufacturing businesses in the State of Washington, such as has been begun by the Washington Department of Community, Trade and Economic Development.

- **Toxic Chemicals:**

Toxic chemicals, particularly persistent bioaccumulative toxins (PBTs), pose significant threats to salmon as they accelerate the incidence of chemical effects, such as modification of DNA, and alter immune functions. In 2000 the U.S. EPA issued a general fish consumption advisory for the Puget Sound due to pollutant contamination, some of which were PBTs. Both the State of Washington and City of Seattle have policy initiatives that acknowledge PBTs' environmental health toll. PBTs with direct links to building materials are cadmium, dioxin, lead, and mercury. In July 2002, the Seattle City Council passed a resolution, introduced by City Councilwoman Heidi Wills, to reduce the purchase and use of persistent bioaccumulative toxics, instructing the City to forego the purchase of products that contain persistent chemicals, or that result in the release of persistent pollution during their manufacture. This resolution echoes our recommendation that the City of Seattle phase-out the use of PVC building materials, lead flashing and other lead roofing products as cost-competitive products of equal or better performance become available; specify paints that meet the Green Seal chemical requirements; prohibit cement kilns from burning fuels that release PBTs; and, work with state and regional agencies to ensure proper disposition of mercury containing light bulbs. As noted above, the only toxic releases to water were those emanating from three wood treatment facilities. Because of the broad risks to salmon, CCA (copper chromated arsenic), creosote and pentachlorophenol wood treatment chemicals should be banned in the tri-county region, with an accelerated phase-out of CCA enacted prior to the US EPA December 2003 sanctioned deadline. Seattle's Department of Parks and Recreation is commended for having prohibited the use of arsenate-treated wood products, and for encouraging the use of safer alternatives including reinforced recycled plastic wood.

Our findings also bring focus to the operational impacts of buildings. In the case of water, we note that Seattle Public Utilities' 1% for Conservation program has already yielded



strong results, with the utility accomplishing a 1% reduction per year since 1980. Similarly, Seattle City Light's commercial energy code is one of the nation's most stringent providing a solid demand side management plan curbing global warming contributions and the potential for habitat decline associated with hydroelectric facilities.

A related finding is that three of Seattle City Light's six largest electric customers are building-related industries: #1 is Birmingham Steel, with Ash Grove Cement #5 and Lafarge Cement #6. Steel and cement – the products of these factories – represent some of the largest volume and highest value materials used in residential and commercial building sectors. These three companies should be encouraged to continue to explore strategies to enhance operational efficiencies, such as have begun with established partnerships between the City of Seattle and Birmingham Steel, that will yield reduced electrical demand and a reduction in associated emissions.

Finding common ground for salmon and buildings is a work in progress, requiring deliberate alignment of design and construction practices and the methods and materials employed with the defining elements of ecosystem health. To the extent that the Pacific Northwest's salmon population serves as the region's yellow canary, ongoing monitoring and recalibration of best practices related to design and construction – where we build, how we build, what we build with – is vital.